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The treatment of severe self-injurious behavior through sensory stimulation: A case report[1]

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Abstract

Self-injurious behavior of an institutionalized man with profound intellectual disability was treated with a daily 15-min sensory stimulation program, which consisted of moving the arms and hands of the participant, swinging his body, and massage. The frequency of self-injurious behavior was measured in 10-min sessions. Using a reversal design, it was shown that sensory stimulation decreased the participant's self-hitting behavior significantly, both in intensity and in frequency. Sensory stimulation is recommended for use in those cases in which functional analysis has shown that self-injury may be reinforced by its sensory consequences.

Keywords: self-injurious behavior; intellectual disabilities; sensory stimulation; institutional care

Introduction

Among the behavioral disorders observed in people with developmental disabilities, self-injurious behavior is one of the most distressing. Self-injury has been found to be a common phenomenon especially in big institutions for people with intellectual disabilities (Saloviita, 2000). Ward personnel are usually accustomed to witnessing how some residents repeatedly bang their heads against walls, slap or strike themselves, or bite their own hands. In a study of an institutional population with intellectual disabilities, the most common forms of self-injurious behavior that were observed in more than 10% of the cases were self-slapping, self-scratching, head banging, self-biting, and self-smearing (Saloviita, 2000). Similar results have been reported in other studies (Richman & Lindauer, 2005; Taylor, Oliver, & Murphy, 2011).

Self-injurious behavior has been defined as encompassing non-accidental self-inflicted acts that cause damage to body tissue but are carried out without suicidal intent (Yates, 2004). Studies on the prevalence of self-injurious behavior among people with intellectual disabilities have reported highly variable results, with the prevalence rates ranging from 8.8% to 40.6% in institutions, and from 1.1% to 10% in community settings (Saloviita, 2000). On the brighter side, in the majority of cases, self-injurious behavior seems to be quite mild, with minor damage to the person (Hüllert, 1986; Windahl, 1986). The consequences of self-injurious behavior most often are various deformations of the skin, such as bleeding wounds, bruises, and thickening of the injured connective tissue. In extreme cases, an individual may beat or gouge himself to unconsciousness or blindness or possibly even death unless stopped (Baumeister & Rollings, 1976; Windahl, 1985). In addition to direct physical harm, there may be other indirect negative consequences of self-injurious behavior. It may prevent a person from participating in educational or leisure programs. Self-injurious behavior also indicates social deviancy, as a result of which the patient may be segregated from other people. A self-injuring person may also spread feelings of anxiety, demoralization and hopelessness among the care staff.

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Various methods have been applied to prevent the potential tissue damage caused by self-injurious behavior. One method is the use of restraining clothing. An individual may also be tied fast e.g., in his bed. Psychotropic drugs are regularly used, but their efficacy is often controversial. These methods are also associated with negative side-effects, as physical or chemical ties restrict constructive adaptation to the environment. Moreover, restraints may be dangerous, because an individual may be strangled or suffocated by them (Beasley, 1986).

Contrary to commonly held beliefs among care personnel in the field of intellectual disabilities, self-injurious behavior is not always an insurmountable disorder. A large body of research beginning from the mid-sixties of the last century has demonstrated the effectiveness of various behavioral treatments for self-injurious behavior. Research shows that self-injurious behavior is a complex form of behavior that may be developed and maintained through various mechanisms (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982). Accordingly, several approaches and interventions have been shown to be effective in reducing it (Murphy & Wilson, 1985; Rojahn & Schroeder, 2007).

During the 60s, it was observed that self-injurious behavior may have an operant basis. It was reasoned that self-injurious behavior may be maintained through environmental factors such as social reinforcement (Lovaas, Freitag, Gold & Kassorla, 1965; Lovaas & Simmons, 1969; Wolf, Risley, & Mees, 1964) or negative reinforcement through escape from demands (Carr, Newsom & Binkoff, 1976; Devlin, Leader, & Healy, 2009; Durand, 1982; Iwata et al., 1982). Moreover, various organic or biological explanations for self-injurious behavior have been presented (Cataldo & Harris, 1982; Peebles & Price, 2012).

Nowadays it is concluded that self-injurious behavior may develop from early repetitive behaviors. These behaviors may first result in the development of homeostatic functions that regulate the overall degree of stimulation. Repetitive behavior may further be shaped into self-injurious behavior through socially mediated or automatic operant reinforcement (Furniss & Biswas, 2012). What is common in many of these explanations is the hypothesis that self-injurious behavior is maintained by the sensory stimulation it provides (Edelson, 1984). From a learning theory perspective, sensory stimulation can be seen as a form of automatic reinforcement. Some studies have shown that self-injurious behavior can indeed be reduced by eliminating its sensory consequences through a process called sensory extinction (Dorsey, Iwata, Reid, & Davis, 1982; McKerchar, Kahng, Casioppo, & Wilson, 2001; Rincover & Devany, 1982; Van Houten, 1993).
Proponents of the sensory integration therapy (Ayres & Tickle, 1980) have argued that the abnormal behavior observed in people with autism is caused by a defect in the nervous system as a result of which sensory stimuli are processed and integrated abnormally. According to them, providing specific forms of sensory stimulation via sensory integration therapy can improve the nervous system's ability to process sensory stimuli and reduce the frequency and intensity of the problematic behavior (Ayres & Tickle, 1980). However, a systematic review performed on the effects of sensory integration therapy could not confirm these hypotheses (Lang et al., 2012). For example, when sensory integration therapy was compared with behavioral therapy in a case in which self-injurious behavior was maintained by negative reinforcement, only the behavioral intervention was found to be effective (Devlin, Leader, & Healy, 2009). In another study, it was shown that a brushing procedure, based on sensory integration treatment, had no effect on the stereotypical behavior of a boy with autism (Davis, Durand, & Chan, 2011).

The application of sensory integrative therapy has shown no positive effects on self-injurious behavior. However, in cases in which the function of self-injurious behavior seems to be the acquisition of sensory stimulation, the provision of alternative sensory stimulation may function as an extinction protocol for self-injurious behavior. This reasoning is supported by studies which have shown that removing the sensory consequences from self-injurious behavior leads to the extinction of that behavior (Dorsey et al., 1982; McKerchar et al., 2001; Rincover & Devany, 1982; Van Houten, 1993). The treatment for self-injurious behavior should thus start by functional

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analysis, wherein the functional relationships between self-injurious behavior and specific environmental events are assessed (Iwata et al., 1982). According to Iwata et al. (1994), self-injurious behavior was maintained by sensory reinforcement in 26% of the studied cases.

Sensory extinction has been shown to be effective in cases where self-injurious behavior is maintained by sensory reinforcement. In this treatment, the sensory consequences of self-injurious behavior are eliminated in the hope that the corresponding behavior ceases. The application of sensory extinction may be unethical if it only removes the reinforcement produced by self-injurious behavior without replacing it with something else. One solution to this is the non-contingent provision of alternative sensory stimulation.

Sensory stimulation may be used as a way of achieving a state of sensory satiation, wherein sensory feedback through self-injurious behavior is no longer reinforcing. Favell, McGimsey and Schell (1982) showed that the provision of toys and sensory stimulation similar to that of self-injurious behavior reduced such behavior in three children. More active approaches involve the direct provision of sensory stimulation through various means. Taylor and Chamove (1986) used 1- to 5-min daily sessions of vibratory and visual stimulation to reduce the occurrence of self-injurious behavior in an adult with profound intellectual disability. Self-injurious behavior in children with profound intellectual disabilities was suppressed using non-contingent vestibular and tactile stimulation (Sandler & McLain, 2007; Wells & Smith, 1983). Similar results were obtained with daily 1- to 3-h sessions of gross motor activities (Lancioni et al., 1984) and daily 1-h jogging sessions (Baumeister & MacLean, 1984). Other successful means include the use of wrist weights and vibratory stimulation (Demanche & Chok, 2013).

The aim of the present research was to provide another case study on the treatment of self-injury. An effort was made to suppress extreme self-injurious behavior in a man with profound intellectual disability. After two unsuccessful treatment attempts, a program based on sensory stimulation was implemented.

Method

Participant and Setting

The participant was a 25-year-old man who was diagnosed with profound mental retardation. He had lived for 15 years in an institution for people with intellectual disabilities. According to the institutional files, he had already been exhibiting head-banging behavior on his admission to the institution, where he moved from his parents' home at the age of ten. The participant had almost no contact with his parents. His mother never visited the institution, but his father made a visit once a year.

At certain times, the participant banged his head so hardly that he was kept tied in his bed for long periods of time. When this study began, the participant was restrained by means of a strait jacket. Additionally, he was tied up in his bed so that he could not move at all. He rested alone in a locked bedroom. According to the nurses, this arrangement had continued for 6 months, during which time the participant was released only when he had to eat and wash up.

The participant walked independently but clumsily, and often used to crawl. He also made many involuntary movements. Later, when he was released from the bed, he would walk around and fiddle with the strings of his strait jacket. He did not speak, and communicated with the staff sometimes by leading the other person using his hand without looking into eyes. The participant also tried to scratch the other person at times. He also had a heavy antipsychotic medication.

The participant lived in a ward of 17 residents with minimal furnishing and a staff of 12 persons. There were five staff members in the morning shift, three in the evening shift, and one member at night. The residents had no daytime activities. They were divided into small groups that

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were separated from each other in the living room and entrance hall. Some residents were locked in their bedrooms. All the doors within the ward were kept closed. Strait jackets and other restraining clothes were frequently used to prevent damage from self-injurious behavior.

Functional Analysis and Research Design

Based on an informal observation of the participant, it was hypothesized that his self-injury was maintained by automatic sensory reinforcement. The first treatment attempted was sensory extinction and reinforcement of other behaviors by social praise and tangible reinforcers (Phase B). When this did not work, the tangible reinforcers were replaced with a short physical restraint (Phase C), which has been shown to be rewarding in 15% of people with self-injurious behavior (Favell, McGimsey, Jones & Cannon, 1981). In the last phase, sensory stimulation was implemented (phase D). The study was started with a baseline measurement (A) that was repeated two times in order to establish the experimental control. The final scheme was an ABCADAD reversal design, which is an instance of several single-case reversal designs (Kazdin, 1982; Kennedy, 2004). The phases and treatment methods are explained in detail in the chapter "Study Phases and Results".

Definition and Measurement of Self-injurious Behavior

The target behavior was defined as "hits himself or bangs his head." Hitting included banging the head on a wall, hitting the head with a fist or with a knee, hitting the body with elbows, or kicking the ankles. The movement was not counted as a hit if it was only a light touch. During phases B and C, when hits were prevented, the number of attempts was also counted.

The frequency of hitting was calculated during the observation sessions as the number of hits per minute. At baseline A_1, the observation sessions were of a 5-min duration. In phases B and C, the behavior was measured during 10-min treatment sessions. In all the other phases, the behavior was measured in 10-min sessions twice a week. These observation sessions were organized outside the treatment sessions so that during Phase D, they represented the generalized effects of the treatment.

Interrater reliability was calculated ten times during different phases of the study by using a second independent observer. It was calculated as a frequency ratio by dividing the smaller total by the larger total and multiplying the quotient by 100 (Kazdin, 1982). The interrater reliability varied between 83% and 100%, with a mean of 94%.

Study Phases and Results

When the study began, the participant had spent several months in a state of severe sensory deprivation. According to ward staff, he was fastened firmly in his bed and left in his bedroom, where the lights were turned off. He was left alone, and the staff were only present for feeding, washing, and changing his diapers. When the first baseline measurement started, several outsiders entered the ward: two observers, a physician, and a camera man with a light assistant. The first baseline consisted of four measurements. The participant was released from his ties, and the frequency of hits was determined. The results are presented in Figure 1. The first marker of Phase A_1 represents results from a 2-min observation session, and the other markers represent the results from 5-min observation sessions. All the other markers in Figure 1 represent the mean values of four 10-min observation sessions.

When the participant was released during the first baseline measurement, he was very upset, and his head banging behavior was dangerously forceful and frequent as he hit himself approximately every fourth second. The measurement was interrupted by the attending physician

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after 2 min, and the participant was tied down to his bed. The four measurements were made over a subsequent period of days. During the first three baseline sessions, the participant banged his head violently, but during the fourth measurement his behavior changed and he seemed to be calmer. The frequency of his self-injurious behavior continued at this lower level during the following treatment phases and the second baseline session.

Phase B consisted of fourteen 10-min sessions, with one to four sessions every day. The participant sat at a table with the instructor on the opposite side. The treatment consisted of the differential reinforcement of other behavior (DRO) program and sensory extinction. If the patient refrained from hitting himself for 5 s, he was rewarded with verbal praise and food. However, hitting was physically interrupted by the instructor in order to prevent any consequences. Because no reduction in self-injurious behavior was observed, the treatment was discontinued and replaced by phase C treatment.

Phase C comprised twelve 10-min sessions that were conducted two to four times each day. The treatment consisted of DRO and sensory extinction protocol. The participant sat opposite the instructor. Hitting was shortly prevented. Five seconds without hitting was followed with a 10-s firm holding of the arms and verbal praise. This kind of physical restraint has shown to be useful in some cases where it has functioned as reinforcement for persons with self-injurious behavior (Favell, McGimsey, Jones & Cannon, 1981). Treatment C was discontinued after it became evident that no deceleration in self-injurious behavior had occurred. A short baseline (A) consisting of seven 10-min sessions was used for taking control measurements.

In phase D, a sensory stimulation program was implemented. The program was prompted by music delivered through an audiotape. The instructor held the participant, turned on the music, moved the participant's arms and legs, and swung his body. The session also included massage with hands and a machine. This session lasted 15 min and was administered once every day.

Treatments B and C were unsuccessful compared to the last baseline session or the succeeding second baseline session, but the sensory stimulation program in phase D led to a decrease in the frequency of self-injurious behavior (Figure 1). The first treatment phase D was continued for 9 weeks. During this time, the staff stopped tying the participant to his bed because he had calmed down to a great extent. He continued to wear a strait jacket, where his hands were enclosed in padded mittens. His self-injurious behavior did not cease altogether, but it was milder and was no longer dangerous. He was no longer upset, as was the case initially, but breathed and moved more calmly. At times, his self-hitting and head-banging behavior, however, became more violent in nature. From phase D onwards, the markers in Figure 1 represent the mean values from four 10-min measurements, with two measurements performed every week.

For the purpose of establishing the experimental control, we interrupted the sensory stimulation program after nine weeks of its implementation. The third baseline session was carried out over an 18-week period. During this period, the hitting frequency began to slowly increase again. During the last two weeks of the third baseline session, the hitting became more frequent and violent. This change is observable only in the last marker of the baseline in Figure 1, which summarizes the observations of the last two weeks of this phase.

Because the self-hitting began again, the sensory stimulation program was reinstated. The hitting began to decrease again, with similar results reported as in phase D_1. From this phase onwards, the daily sensory stimulation session was continued as a regular procedure without any time limits.

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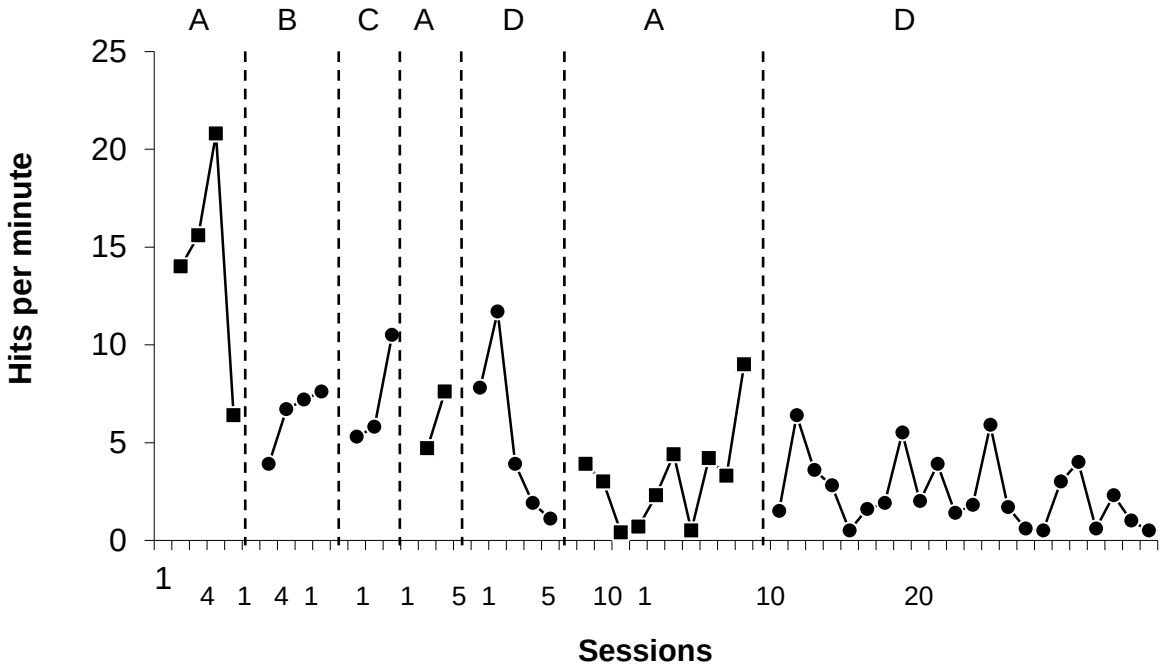

Figure 1. Occurrence of self-injurious behavior per minute during the baseline sessions (A) and treatment sessions (B, C and D)

Discussion

A short 15-min daily sensory stimulation program led to a significant decrease in the self-injurious behavior of the participant. As a consequence, he was released from the mechanical restraints that prevented him from moving or using his arms and fingers. However, despite the decrease in his self-injurious behavior, it did still persist and was even severe at times.

The first three measurement periods witnessed higher occurrence of self-injurious behavior than the later measurement periods. This change may be related to the research process itself. When the study had started, there was a sudden significant increase in the number of outsiders interacting with the participant. This seemingly encouraged the ward staff to attempt more active treatment instead of only tying the patient down to the bed in his straitjacket. Most importantly, the staff began to release the participant at times from his bed. As a result, the participant had new opportunities for sensory experiences, which possibly resulted in the decrease in self-injurious behavior.

The results of this study are in accordance with previous findings on the effects of sensory stimulation on self-injurious behavior (Baumeister & MacLean, 1984; Demanche & Chok, 2013; Lancioni, Smeets, Ceccarani, Capodaglio, & Camparani, 1984; Sandler & McLain, 2007; Taylor & Chamove, 1986; Wells & Smith, 1983).

Three years after the start of this study, the participant was transferred to a small community group home located closer to his parents' home. In the group home, he was dressed in normal attire instead of protective overalls. His behavior continued to remain the same. In the group home, the sensory stimulation program was continued daily. The care staff reported that the participant enjoyed all kinds of massage treatments, but the moving of the arms and legs was removed from the program because the participant had begun to resist this part of the treatment.

Some years after the move to the group home, the participant died. During his last years, he occasionally had short periods of heavy self-hitting during which he was exceptionally restless. For

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the most part, however, the hitting was light and was reduced to almost a kind of symbolic touching. With all the information available about this case, it is possible to draw a picture of the possible vicious cycle that led to the participant's severe self-hitting behavior. The occasional periods of heavy self-hitting at the institution led the staff to use mechanical restraints to prevent tissue damage from occurring. Because of the crowded living situation at the institutional ward and lack of staff, the use of these restraints became a routine procedure. The restraints were not removed even when they were unnecessary. This led to sensory deprivation, which probably increased the sensory reinforcement obtained from self-hitting.

This case study provides another example of the usefulness of sensory stimulation treatment when functional analysis has shown that self-injury may be caused by automatic sensory reinforcement. It also highlights the mechanisms through which poorly staffed institutional care may be risky for persons with intellectual disabilities. Some years after the participant was moved to a smaller and better resourced group home, his previous institutional ward was closed. Even though the institution still continues to exist, its population has dropped and reforms have been undertaken to guarantee better quality of care for its remaining residents.

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